

[Name of the Document] Specification

[Title of the Invention] METHOD FOR DRY ETCHING

[Claims]

[Claim 1] A dry etching method using a dry etching apparatus having a dual power source capable of independently controlling source power for generating a plasma and bias power for drawing ions from the plasma into a substrate,

in which an object to be etched by the dry etching apparatus includes a silicon substrate or a silicon-containing member formed on a substrate,

the method characterized by comprising the steps of:

10 placing the substrate in a reaction chamber of the dry etching apparatus;

introducing a process gas into the reaction chamber;

applying bias power to the substrate; and

generating a plasma with the application of source power,

wherein the application of the bias power is initiated before the oxidation of the

15 surface of the object to be etched proceeds.

[Claim 2] The dry etching method of claim 1, characterized in that the application of the source power is initiated after the application of the bias power is initiated.

[Claim 3] The dry etching method of claim 1, characterized in that the application of the source power is initiated such that an effective value of the bias power reaches a 20 predetermined value before an effective value of the source power reaches a predetermined value.

[Claim 4] A method for fabricating a semiconductor device in which the method for dry etching of any one of claims 1, 2 and 3 is applied to the dry etching of silicon in a process for forming an isolation.

25 [Claim 5] A method for fabricating a semiconductor device in which the method

for dry etching of any one of claims 1, 2 and 3 is applied to the dry etching of a polysilicon film in a process for forming a gate electrode.

[Claim 6] A method for fabricating a semiconductor device which comprises a dry etching method using a dry etching apparatus having a dual power source capable of 5 independently controlling source power for generating a plasma and bias power for drawing ions from the plasma into a substrate,

the semiconductor device fabrication method characterized by comprising the steps of:

10 placing a substrate having a silicon-containing member exposed therefrom in a reaction chamber of the dry etching apparatus;

introducing a process gas into the reaction chamber;

performing dry etching of the silicon-containing member exposed at the surface of the substrate by application of the bias power and the source power;

15 oxidizing a damaged layer generated due to the dry etching; and

cleaning the damaged layer to remove it,

wherein the oxidization of the damaged layer is performed in the reaction chamber by applying not the bias power but only the source power using the plasma.

[Claim 7] The method for fabricating a semiconductor device of claim 6, characterized in that the silicon-containing member exposed at the surface of the substrate 20 is a silicon substrate and the dry etching step is the step of forming a trench for isolation in the silicon substrate.

[Claim 8] The method for fabricating a semiconductor device of claim 6, characterized in that the silicon-containing member exposed at the surface of the substrate is a polysilicon film formed on a gate insulating film and the dry etching step is the step of 25 forming a gate electrode by etching the polysilicon film.

[Claim 9] A method for fabricating a semiconductor device, comprising the steps of:

5 placing a silicon substrate in a reaction chamber of a dry etching apparatus, the dry etching apparatus having a dual power source capable of independently controlling source power for generating a plasma in a chamber and bias power for drawing ions from the plasma into a substrate;

placing a substrate in the reaction chamber of the dry etching apparatus;

introducing a process gas into the reaction chamber;

10 forming a trench for isolation by dry etching part of the silicon substrate with the application of the bias power and the source power;

forming an oxide film by oxidization of the surface of the trench for isolation;

filling the trench for isolation in the substrate, on which the oxide film is formed, with an insulation film for isolation; and

15 polishing part of the insulation film for isolation by CMP so as to remove it, thereby planarizing the surface of the substrate.

[Claim 10] A dry etching apparatus having a dual power source capable of independently controlling source power for generating a plasma and bias power for drawing ions from the plasma into a substrate, comprising:

20 bias power adjusting means for initiating the application of the bias power to the substrate while initializing a timer and continuing the application of the bias power until an effective value of the bias power reaches a predetermined value; and

25 source power adjusting means for initiating the application of the source power when the timer indicates that a predetermined time point is reached and continuing the application of the source power until an effective value of the source power reaches a predetermined value.